

Process Tailoring Guideline

Number: 580-GL-071-01

Effective Date: October 10, 2007

Expiration Date: October 10, 2012

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Title: Process Tailoring Guideline

Asset Type: Guideline

PAL Number: 3.5.2.1

Purpose	The purpose of this document is to provide a set of guidelines for tailoring software development/maintenance standards at GSFC to specific types of software projects.
Scope	This document describes tailoring for mission critical software (both class A, human-rated systems, and class B, non-human space-rated systems) and mission support software (class C). It applies to new and continuing projects as well as modification of existing software. The scope of this document is focused specifically on tailoring the set of GSFC software development processes to the needs of a project and documenting the tailoring as the project's defined software processes in a Software Management Plan / Product Plan (SMP/PP).
Method	<p>The tailoring process consists of five distinct tasks:</p> <ol style="list-style-type: none">1. Identifying project characteristics2. Reviewing the set of GSFC Standard Software Processes (SSP)3. Choose and tailor processes from the SSP4. Create compliance matrices5. Document the project's defined processes in a SMP/PP6. Prepare deviations, (e.g., document deviations from the standard) <p>The above tasks should be repeated as the project situation dictates, e.g., when a needed process is added, updated, or work changes in such a way that what is to be done changes.</p>
Key Definitions	<p>Deviation: An allowance for a departure from a requirement or specification.</p> <p>Standard Software Processes (SSP): the collection of processes located in the GSFC Software Process Improvement website, also known as the Process Asset Library (PAL), at http://software.gsfc.nasa.gov/.</p>
Introduction to Tailoring	Using the SSP and a common set of requirements for all projects helps make planning and management easier through supporting the use of materials, methods, tools, lessons learned, etc., from previous projects. The definition of a software process is how management and engineering practices are implemented to support software development and/or maintenance. An organization has a set of building blocks that defines the general way it does business and some subset (tailoring the SSP) of those building blocks (software processes) are implemented for each software project.

**Tailoring the
Standard
Software
Processes**

Tailoring the SSP takes guidance from tailoring options that are defined in individual PAL processes, information about the new project, subject matter experts, and GPR 8700.5, In-House Development and Maintenance of Software Products. Tailoring guidelines must be applied in a manner that will preserve the benefits of having common practices. These guidelines grant projects the flexibility to operate efficiently, while also preserving the maximum amount of commonality possible and meeting GSFC and Agency requirements. In practice, the goal is to maintain as much of the process as possible while adjusting attributes to achieve an implementation that is compatible with the nature and goals of the project.

Tailoring does not mean eliminating items from the SSP. That would be a deviation from the SSP and would require approval. If an item is eliminated, it must be documented and approval must be obtained from the GSFC Engineering Process Group (EPG). It is very important to use experienced individuals to help tailor a process and provide guidance. The EPG is available to help projects with this work.

The steps used to tailor GSFC's SSP to the needs of a specific project may be somewhat different depending on specific requirements of the project. In general, however, the following concepts can be used to help think through how to develop a project's defined software processes.

Software projects often include information to develop the project's defined software processes such as:

- a. Project/Mission goals;
- b. Project software criticality, acceptable risk posture, and software class as defined in NPR 7150.2, NASA Software Engineering Requirements;
- c. Project technical work requirements;
- d. Software performance requirements.

This information is combined with programmatic inputs, such as:

- a. GSFC's SSP;
- b. Guidance for tailoring the SSP included within individual PAL processes, this guideline, and GPR 8700.5,
- c. Adherence to agency requirements including in NPR 7150.2,
- d. GSFC's Gold Rules found at <http://gsfcrules.gsfc.nasa.gov/>,
- e. Lesson's learned from previous projects,
- f. Acquisition regulations (if applicable), and;
- g. The sponsor or external customer's software management philosophy.

The tailoring guidelines assist projects in adapting the GSFC SSP to suit a specific environment while preserving the original intent of the artifact being tailored.

**Typical Factors
for Tailoring**

There are many factors that may impact a particular software process or development strategy. Some of these factors are determined outside of the project by the sponsor or other entities such as a customer external to GSFC, but many others are controlled within a project. The following is a list of typical factors that should be considered during the tailoring process:

- Financial constraints, contractual obligations and schedules, which may be strictly determined by a customer;
- Policies imposed by NASA or developing program office within NASA where required for the project;
- Project and software size, criticality, acceptable risk posture, and complexity;
- Specificity and firmness of the requirements;
- Staff experience including experience with use of processes;
- Life cycle and the development / test environment in which the process will be used;
- Inheritance, use of Off-The-Shelf (OTS) software (including commercial, government and modified OTS) , length of operations / use, and evolving nature of the product;
- Verification and validation considerations;
- Lessons learned from previous projects;
- Software acquisition considerations; i.e., contractor qualifications and experience.

Generally, tailoring of the SSP to a specific software project consists of reviewing project information and specific requirements, considering external inputs, and meeting the intent of the SSP. If there are lessons learned from previous projects they should be consulted as well. The key areas to tailor include: documentation, product requirements (e.g., contents of documents), formality and number of reviews, details of personnel roles, concurrency of activities, and frequency and formality of activities.

The outputs of the tailoring process is a set of tailored processes for use on the project which are usually documented in the project's SMP/PP (or put a pointer in the SMP/PP for the process location), compliance matrix, and documented deviations from the SSP, NPR 7150.2, and GSFC's Golden Rules. The generated SMP/PP is reviewed, approved and adhered to by the project and software development team.

**Tailoring
Attributes**

For tailoring to be consistent across all of the entities we need to identify attributes that may be altered. Some of the common attributes are:

1. **Class** – The software classification (or criticality) of the project, derived from definitions in NPR 7150.2, provides a range of tailoring possibilities that are defined in GPR 8700.5 based on the software class.

The general rule of thumb is that Class A (Human-Rated Software Systems) requires the highest level of formality. Class C (Mission Support Software) would require less formality or detail.

2. **Size** – The software size and the number of people on the project, when taken together with software Class, provides an important consideration for formality and the level of detail.

The larger the project and the higher the software classification the greater the need for formality and detail. Class A software should have the highest level of formality (detail) because of the criticality (human-rated nature) of the software even if the project size is small. Class always takes precedence over size as a tailoring consideration. A small Class C project (non-critical mission support software) should tailor to provide less formality and detail. Examples for small projects:

- *Have one person perform two or more roles. Small projects not only have less work but fewer people to perform the various roles.*
- *Combine requirements and design documents into a single document.*
- *Combine required reviews, e.g., PDR and CDR.*

3. **Formality** – Essentially an activity can be performed with varying degrees of detail, or by implementing formal rules, procedures, or standards.

For example, a process containing an activity: “Describe the methods, functions, and tasks required to manage the configuration of the software, including configuration identification, configuration control, status accounting, and configuration audits and reviews.”

Meeting the objective of this activity may range from using simple software version control (e.g., on small Class C mission support projects) to chartering a Configuration Control Board (CCB), formal configuration control, status accounting, and configuration audits and reviews (e.g., on a Class A human-rated project).

4. **Frequency** – There are many activities in the SSP that are performed on a periodic or event-driven basis. The frequency of each activity needs to be interpreted in light of the Project’s needs.

Examples for a small class C project: It may not be necessary to present a Branch Status Review (BSR) on a monthly basis. Several peer or project reviews may be combined into one.

5. **Scope** – It may not make sense to perform certain tasks, due to organizational or project constraints, implementation environment, type of project (development or maintenance, in-house or contracted), etc.

Examples for Scope:

- *Tailor out processes having to do with Supplier Agreement Management (SAM) if the project will be completely done in-house and the project is not purchasing anything.*
- *Tailor out life-cycle processes if the project is not performing that part of the life-cycle.*
- *Tailor out differences due to the project being a development or maintenance effort.*

The tailoring approach is managed and executed in an orderly manner. Specify those items that are produced by the process, identify the tasks that generate and support those products, and specify the existence, nature, and interactions of software roles to produce the desired product.

The lists provided above are a guideline and there are other ways that one can tailor the GSFC SSP.

**Tailoring
Process
Diagram**

Figure 1 is a simplified diagram that shows the tailoring process from the GSFC's SSP to a project's defined software process (a tailored process). The EPG will help with tailoring and Code 300 or the EPG will verify compliance of tailored assets.

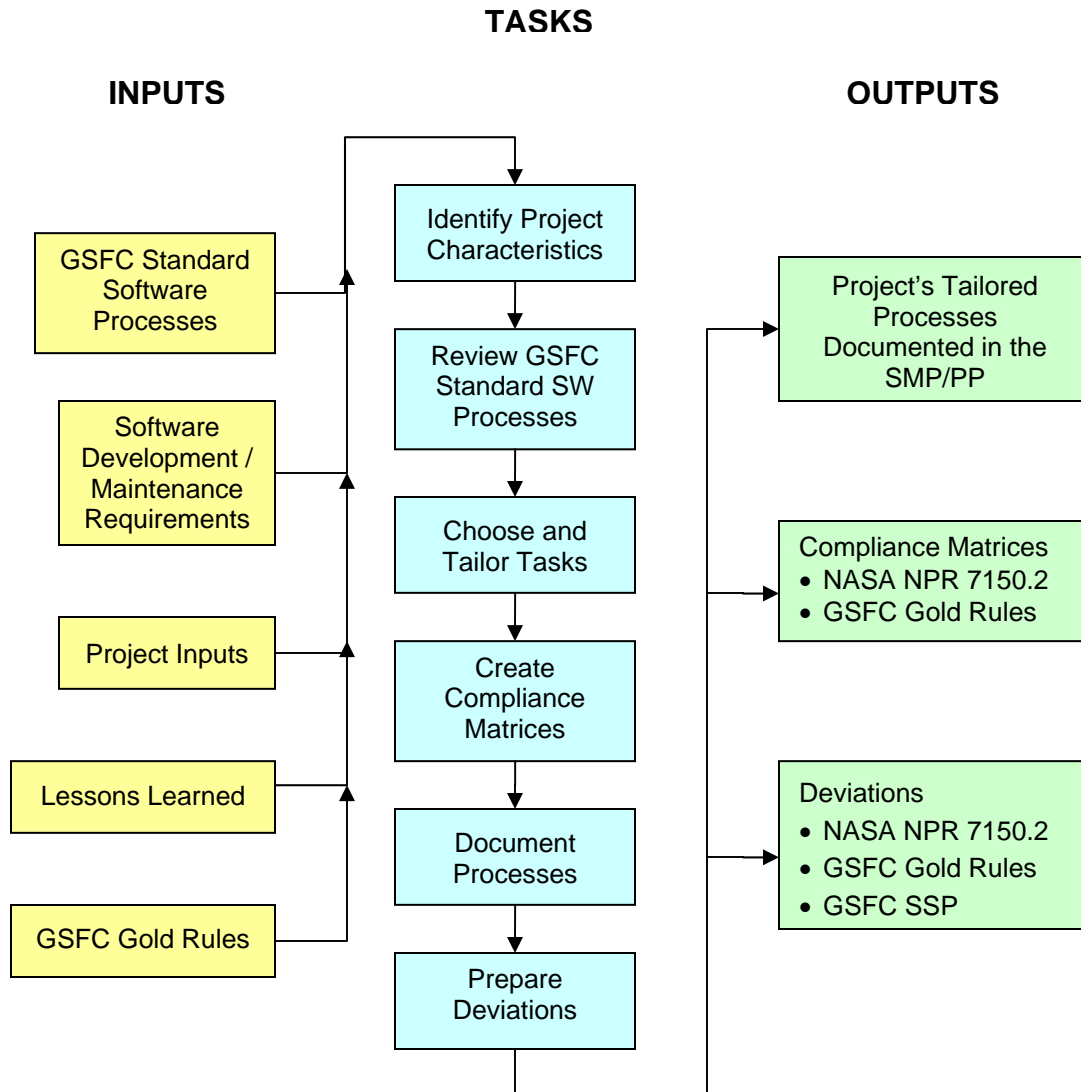


Figure 1: Simplified Tailoring Representation

Tools and Templates

Name	Description
NASA Software Engineering Requirements, NPR 7150.2, Compliance Matrix	Detailed compliance matrix. See http://nodis.hq.nasa.gov for a copy of the compliance matrix in Appendix D.
NPR 7150.2 Deviation Request	Required form to be submitted to the GSFC Office of Mission Success for all NPR 7150.2 deviations. See http://gsfcrules.gsfc.nasa.gov/ for a copy of the Deviation Request.
GSFC Gold Rules Compliance Matrix	Detailed compliance matrix. See http://gsfcrules.gsfc.nasa.gov/ for a copy of the compliance matrix.
GSFC Management System Requirement Deviation/Waiver Request	Required form to be submitted to the GSFC Office of Mission Success for all GSFC Gold Rules deviations/waivers. See http://gsfcrules.gsfc.nasa.gov/ for a copy of the Deviation/Waiver Request
GSFC SSP Compliance Matrix	There is no compliance matrix for the SSP but all changes must be documented in the project's SMP/PP and approved by the GSFC EPG.
GSFC EPG Standard Software Process Requirement Deviation/ Request	Required form to be submitted to the GSFC Engineering Process Group for all Standard Software Process deviations. Copy attached to this guideline.

References

- **Glossary:** <http://software.gsfc.nasa.gov/glossary.cfm>
Defines common terms used in ISD processes
- **Process Asset Library:** <http://software.gsfc.nasa.gov/process.cfm>
Library of all ISD process descriptions, templates, guidelines, checklists
- **Rules for the Design, Development, Verification, and Operation of Flight Systems, GFSC-STD-1000:** also referred to as GSFC's Gold Rules can be found at <http://gsfcrules.gsfc.nasa.gov/>
- **NASA Software Engineering Requirements, NPR 7150.2**
Access via NODIS at <http://nodis.hq.nasa.gov>
- **In-House Development And Maintenance Of Software Products, GPR 8700.5:** Access via GDMS at <http://gdms.gsfc.nasa.gov/gdmsnew/home.jsp>



GSFC EPG Standard Software Process Requirement Deviation Request

See reverse side of form for completion instructions.

Submit completed form to NASA GSFC, Engineering Process Group, Code 585, Greenbelt, MD, 20771

Contact Name:	Code/Organization:	Date Submitted:
Phone:	Email Address:	
Software Process	Software Process Number, Revision and Date:	Section/Task/page reference:
Applicable Requirement:		
Description and Type of Request and Scope of Application: <input type="checkbox"/> Deviation Scope of Request: <input type="checkbox"/> Full <input type="checkbox"/> Partial		
Justification for Deviation/Waiver (see form instructions for required content):		
PDL, DTL, or MTL (sign/date)	Software Manager (sign/date)	
Section Below Reserved for GSFC Engineering Process Group Use		
Request Number:	Date Received:	
All required reviews and approvals have been obtained and I recommend this request be approved.		
_____ Project Manager of Engineering Process Group, Goddard Space Flight Center		_____ Date
_____ Deputy Project Manager of Engineering Process Group, Goddard Space Flight Center		_____ Date

Instructions for GSFC EPG Standard Software Process Deviation Request Form

Initiator Instructions: This form shall be used to request a deviation from any of the GSFC Process Asset Library Standard Software Processes.

Contact Name	Enter the name of the individual to be contacted with regard to the request.
Code/Organization	Enter the contact's organization code number (if applicable) and organization name.
Date submitted	Enter the date the form is submitted to the GSFC Engineering Process Group.
Phone	Enter the contact's phone number.
Email Address	Enter the contact's e-mail address.
Software Process	Enter the title of the software process establishing the requirement for which the waiver is being sought.
Software Process Number, Revision and Date	Enter the software process's number, revision level and issue date.
Section/Task/Page Reference	Enter the section number, task number and or page number where the specific requirement can be found in the software process.
Applicable Requirement	Quote the specific requirement associated with the request.
Description and Type of Request and Scope of Application	<p>Check the appropriate box to indicate whether the request is for a deviation:</p> <p>Deviation - An allowance for a departure from a requirement or specification before the departure has occurred.</p> <p>Indicate the exact nature of the request in terms of whether some or all of the requirement is to be waived and the scope of application of the deviation in terms of software, processes, organization, etc.</p>
Scope of Request	Indicate the scope of the request by checking the appropriate block. The scope indicates whether the subject departure applies to the entire requirement or some portion of it.
Justification for Deviation	Indicate the cause for failing to implement the applicable requirement. Indicate risk acceptance associated with approval of the request. Identify negative impacts to cost, schedule, performance and safety associated with request approval or disapproval.
PDL, DTL, MTL Signature/Date	The applicable Product Development Lead, Development Team Lead, Maintenance Team Lead, etc.) of the associated product must indicate concurrence.
Software Manager Signature/Date	The applicable Software Manager at the Project Level or the deputy must indicate concurrence.

Submit completed form to NASA GSFC, Engineering Process Group, Code 585, Greenbelt, MD, 20771

GSFC ENGINEERING PROCESS GROUP INSTRUCTIONS

Request Number	The GSFC EPG shall indicate an assigned, unique request tracking number.
Date Received	The GSFC EPG shall indicate when the request was received.
Project Manager of Engineering Process Group	The GSFC EPG determines the review routing for each request. Signature indicates that all necessary pre-approvals have been obtained and that the Project Manager of the GSFC EPG concurs with the approval recommendations.
Deputy Project Manager of EPG	Signatures indicate approval of the request.

Return the original signed request to the Project Manager of the EPG, who shall seek any required review/approval beyond that of Goddard. Once all necessary approvals have been obtained, the Project Manager of the EPG shall provide a copy to the requestor and maintain the original as the official record.

Change History	Version	Date	Description of Improvements
	1.0	10/05/07	Initial approved version by CCB